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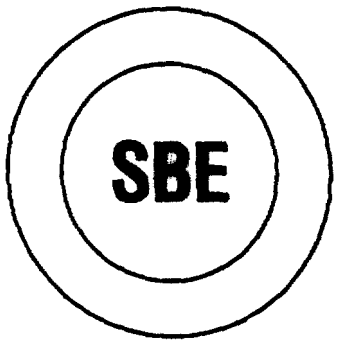
Comments of the Society of Broadcast Engineers, Inc.

ET Docket 98-142
7 GHz Earth-to-Space MSS Downlinks



September 21, 1998

SOCIETY OF BROADCAST ENGINEERS, INC.
Indianapolis, Indiana

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2, 25 and 97 of the Commission's rules with Regard to the Mobile-Satellite Service Above 1 GHz	)	ET Docket No. 98-142

To: The Commission

Comments of the Society of Broadcast Engineers, Inc.

The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, with more than 5,000 members in the United States, hereby respectfully submits its comments in the above-captioned Notice of Proposed Rulemaking (NPRM) relating to the use of the 6,875–7,125 MHz TV Broadcast Auxiliary Services (BAS) band by the Mobile–Satellite Service (MSS) for space-to-Earth downlinking.

I. Protocols for "Co-Primary" Sharing Need to be Clarified

1. Paragraph 22 of the NPRM proposes allocating 6,700–7,075 MHz, on a co-primary basis, with non-geostationary satellite orbit ("NGSO") MSS space-to-Earth transmissions, in addition to the current sharing, again on a co-primary basis, with MSS Earth-to-space uplinks. As noted at Paragraph 22 of the NPRM, there are currently few such uplinks.

2. When two services share frequencies on a co-primary basis, SBE understands that to mean that newcomer stations in "Service A" must protect all existing stations in "Service B," and likewise newcomer stations in Service B must protect all authorized stations in Service A (in addition, of course, to protecting all existing stations in their own service).

3. As will be subsequently shown, SBE believes that NGSO MSS downlinks are unlikely to ever be an interference threat to terrestrial 7 GHz TV BAS stations, but believes that the reverse may not be true, especially in the case of airborne TV Pickup ("TVPU") links. Because TVPU stations are, by definition, mobile, and because such stations may be operated anywhere in the United States, it follows that, as pre-existing stations, NGSO MSS

downlink receive facilities will always have to accept whatever interference might be caused from such operations.

4. Because of the existence of 7 GHz TVPU stations with nation-wide operating authority (at least in the case of TV Pickup stations licensed to TV Network and Cable Network entities) would already place any newcommer MSS downlink receive sites at risk, SBE proposes that there be no restriction on newcomer 7 GHz TVPU stations to protect NGSO MSS downlink receive sites, because the existing population of TVPU stations is already deeply embedded throughout the entire country. That is, while SBE understands that newcomer fixed, terrestrial, 7 GHz TV BAS links should be obligated to demonstrate protection of NGSO MSS downlink receive sites that predate them (and SBE believes that such protection would not be a burden), SBE believes that newcomer TVPU stations should not have to bear any such responsibility; or, in other words, SBE believes that the Commission should NOT create two classes of TV Pickup stations: one a "grandfathered" class, that would have no restrictions on its operational areas, and a second, restricted, class, that would have to avoid operations near existing NGSO MSS downlink receive sites.

5. For protection of 7 GHz TV BAS stations against interference from MSS downlinks, SBE proposes that such stations must either provide a desired-to-undesired ("D/U") signal ratio of at least 60 dB for co-channel and at least 0 dB for adjacent-channel, or, alternatively, demonstrate a receive carrier level ("RCL") of at least 10 dB below the threshold of the TV BAS receiver in use; for 25M0F9W wideband FM analog video, the receiver threshold is typically -86 dBm. As will be shown, SBE believes that such protection will inherently be provided by space-based MSS transmitters that meet the proposed power flux density ("PFD") limits.

6. While the demonstration of such protection is straightforward for fixed, point-to-point TV BAS stations such as studio-to-transmitter links ("STLs"), transmitter-to-studio links ("TSLs"), and inter-city relays ("ICRs"), it is much more difficult for TVPU stations, which, by their nature, have either a mobile or portable receive site, or fixed receive site with either an omnidirectional receiving antenna or a steerable directional receiving antenna. The resulting RCL is, therefore, varying and not predictable. As a resonable surrogate for protecting 7 GHz TVPU stations, SBE proposes that no NGSO MSS downlink receive site be permitted within 100 kilometers of the top 100 TV markets; that is, newcomer MSS downlink receive facilities should not be allowed in areas where 7 GHz TV BAS mobile operations (especially airborne operations) are likely to exist.

7. In a similar vein, SBE believes that MSS downlink receive stations need to be required to frequency coordinate with broadcasters and to have clearly defined interference protection criteria, so broadcasters will 1) know where such receive sites are located and 2) know what protection criteria needs to be demonstrated when designing new, or modified, fixed 7 GHz TV BAS terrestrial links.

II. SBE Concurs with Proposed Power Flux Density Limits for NGSO MSS Space-to-Earth Links

8. At Paragraph 20, the NPRM provides a table showing proposed PFD limits that a space-to-Earth NGSO MSS downlink could not exceed at the Earth's surface. The worst case would be for elevation angles of 25 to 90 degrees, where a PFD of -124 dBW/m^2 in 1 MHz, or -110 dBW/m^2 in 25 MHz, would be allowed. This is the most critical case, because for airborne TV Pickups (*e.g.*, helicopter-to-ground or blimp-to-ground links), the TVPU receiving antenna would be aimed at, or near, the vertical. However, SBE notes that even for this case the NGSO MSS downlink signal should be well below the -86 dBm signal threshold of a typical TVPU receiver, as follows:

> PFD = EIRP/($4\pi R^2$). Or, solving for the EIRP, EIRP = $4\pi R^2$(PFD). Assume a NGSO satellite height of 100 miles (161 kilometers) above the earth. The EIRP limit in dBW from such a satellite would be the PFD in dBW/m^2 + 10log(4π) + 20log(R_{meters}). Substituting in the worst case PFD limit of -110 dBW/m^2 in a 25 MHz bandwidth gives a satellite EIRP limit of -110 +11.0 +104.1, or +5.1 dBW, or 3.2 W.

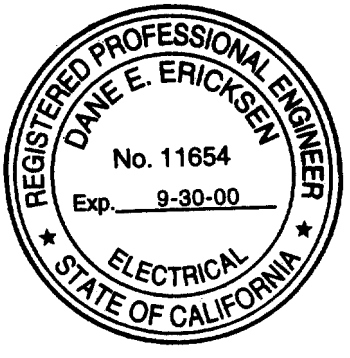
9. Calculating the expected receive carrier level of a +5.1 dBW EIRP transmission at 100 miles above the Earth to a 10 dBi gain TV Pickup receiving antenna aimed straight up, and with 1 dB of waveguide loss, gives a receive carrier level of +5.1 dBW -153.5 dB free space path loss (FSPL) + 10 dBi receiving antenna gain -1 dB waveguide loss, or -139.4 dBW. Converting to dBm gives -109.4 dBm, or about 23 dB below the threshold sensitivity of a typical TV BAS FM analog video receiver. For fixed terrestrial links, which use large, parabolic receiving antennas typically with elevation angles of 10° or less, providing at least 30 dB of off-axis suppression, space-to-Earth MSS downlink transmissions would be even less of a threat. Therefore, SBE concludes that the proposed PFD limits are adequate to ensure that a NGSO MSS space-to-Earth transmission will not, in fact, cause interference to existing 7 GHz TV BAS operations.

III. Summary

10. SBE does not object to NGSO MSS sharing 7 GHz TV BAS frequencies for space-to-Earth downlinking because it believes that the proposed PFD limits at the Earth's surface will ensure no harmful interference to TV BAS operations, even for worst case air-to-ground links. However, SBE believes that terrestrial TV BAS operations, especially air-to-ground, mobile, TVPU links may be a serious interference threat to MSS downlink receive sites, and for that reason believes that such newcomer receive sites should only be allowed outside of the major metropolitan areas, where TV Pickup operations are unlikely to regularly occur. Finally, SBE acknowledges the obligation of newcomer or subsequently modified fixed 7 GHz TV BAS links to protect existing NGSO MSS downlink receive sites, so long as such stations are required to frequency coordinate with broadcasters and so long as the protection criteria is clearly spelled out in the FCC Rules.

Society of Broadcast Engineers, Inc.

By _____
Edward Miller, CPBE
President



By _____
Dane E. Ericksen, P.E., CSRE, CSTE
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By _____
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September 21, 1998

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